

U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY

Base from U.S. Geological Survey, 1955; photorevised 1979  
Projection: Universal Transverse Mercator, zone 13.  
10,000-foot grid based on Colorado  
coordinate system, south zone.  
1927 North American datum

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET

SURFICIAL GEOLOGY ALONG THE MIDDLE AND SOUTH FORKS OF MINERAL  
CREEK IN THE OPHIR QUADRANGLE, ANIMAS RIVER WATERSHED, SAN  
JUAN COUNTY, COLORADO

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Geology mapped by Blair, 1998–1999.  
Digitally compiled by Yager, 1998–1999

DIGITAL DATA SERIES 71  
PLATE 3

DESCRIPTION OF MAP UNITS

[Unit descriptions do not differ between plates 1 through 10 with the exception of bedrock, which does differ based on lithologies and geologic formations represented in a mapped area. Prefix "r" indicates alluvial, colluvial, or glacial deposits disturbed by human activities. For example, rfp refers to reworked floodplain deposits from gravel mining operations. Unit symbols separated by a slash indicate that two units are preserved in mapped area; color in box denotes predominant unit. Uncolored boxes denote units not mapped on this plate]

ALLUVIAL DEPOSITS

Floodplain deposits (upper Holocene)—Unconsolidated sand and gravel, commonly with silt matrix; poorly sorted, subround to round gravels, commonly imbricated; boulders as much as 0.5 m in diameter common in upper Animas River watershed. Deposited in active stream channels and as overbank sediment on adjacent terraces less than 1 m above channel. Mostly deposited during spring floods and storm discharge events. Natural, fluvial processes throughout the watershed and, in places, human activities, such as between Eureka and Howardsville, have reworked many floodplain deposits since 1860. Red (iron oxide), white (aluminum hydroxide), and black (manganese oxide) staining of floodplain sediments in some reaches indicates high concentrations of dissolved metals. Thickness 1–10 m

Terrace deposits (Holocene to uppermost Pleistocene)—Unconsolidated sand and gravel with silt matrix; poorly sorted, subround to round gravels, commonly imbricated; boulders as much as 0.5 m in diameter common in upper watershed reaches. In highly

mineralized drainages, iron-oxide cements form ferricrete (iron-cemented conglomerate). Sediment is deposited during spring runoff and storm over-bank flow discharge events. Surfaces are narrow and flat, and parallel the modern stream channel. Where differentiated by their relative ages, youngest terraces are labeled t1, lie 1–2 m above the modern channel, and predate 1860 (Kirk Vincent, U.S. Geological Survey, written commun., 2001). Sequentially higher and older terraces are designated t2, t3, and t4. Higher terraces display stronger color and textural B soil horizons. Terrace height above the stream channel varies from 2 to 10 m. Terraces in the headwater regions of the Animas River watershed are not necessarily correlative with terraces in the lower Animas River basin. Thickness 1–10 m

Valley deposits (upper Holocene)—Unconsolidated sand and gravel with a silty matrix and occasionally larger stones derived from valley sides. Deposits formed by fluvial and colluvial processes including periodic floods, small debris flows, and slope wash. Deposits often found on slightly concave valley floors near the heads of tributaries where no distinct fluvial terraces or alluvial fans can be found. Deposits are both historic and pre-historic in age. Thickness 1–5 m

Alluvial fan deposits (Holocene to uppermost Pleistocene)—Unconsolidated, poorly sorted sand and gravel with silt matrix; cobbles and boulders common. Sediment supplied episodically to fan surfaces by streams and debris flows along confined, commonly braided channels from seasonal storm runoff events. Form as fan-shaped deposits (in map view) at mouths of streams where stream gradient and velocity decreases and where topography widens from confined channels to open valleys. Surface gradients are less than 20°. Fan development post-dates glaciation and therefore their growth was initiated after 15 ka. Where the relative fan age can be differentiated from cross-cutting geometry, the younger fan segments are designated as f1 and the older as f2 and f3. Thickness 1–20 m

Bog deposits (Holocene)—Consist of water-saturated, spongy masses of live and decayed vegetation, bacteria, and peat often associated with shallow standing water. Masses of organic matter produce strong reducing and often, anoxic depositional environments. Forms wetland surfaces, often hummocky and stair stepped on gentle hill slopes adjacent to streams or active springs. Commonly found behind beaver dams. Ages range from present to thousands of years (Stan Church, written commun., 2001). Thickness 1–5 m

## COLLUVIAL DEPOSITS

Colluvial deposits (upper Holocene to uppermost Pleistocene)—Unconsolidated soil and sand- to cobble-size debris derived from valley walls. Processes include rockfall, sheetwash, and creep. Colluvium is discontinuous on the valley sides and produces irregular-shaped, hummocky surfaces. Growth has been continuous since glacial retreat. Thickness 1–5 m

Talus deposits (upper Holocene to uppermost Pleistocene)—Unconsolidated, poorly sorted, angular, cobble-size stones and blocks derived from rock falls above the talus field. Deposits blanket topography on steep valley slopes at the angle of repose (33°–35°). Growth has been continuous since glacial retreat. Thickness 1–5 m

Landslide deposits (upper Holocene to uppermost Pleistocene)—Unconsolidated, poorly sorted silt to angular boulder-size clasts consisting of lithologies derived from local formations. Includes deposits formed mainly by translational and rotational slope failure stemming from over steepening by fluvial and glacial erosion and weathering. Deposits form lobate, hummocky surfaces along valley sides. In glacial valleys, the larger

landslides formed as glacial ice withdrew. Ages of most deposits unknown. Where relative age of adjacent landslide deposits can be differentiated from cross-cutting geometry, the younger segments are designated as ls1 and the older as ls2. Thickness 1–10 m

## GLACIAL DEPOSITS

Glacial till deposits (upper Pleistocene)—Unconsolidated to compacted, poorly sorted, clay to boulder-size sediment derived from ablation of glaciers at ice margins. Form hummocky end and lateral moraine ridges. Best displayed at north end of Durango and near Silverton. Deposits represent the last vestiges of glaciers between 12 and 15 ka. Carrara and others (1984) and Maher (1972) indicated ice-free conditions existed as early as 15 ka, but recent data indicate ice-free conditions at around 12 ka (Gillam, 1998). Till deposits north of Durango are subdivided into two relative ages. Animas City moraines (ma) are 15–25 ka and Spring Creek moraines (ms) are 85–160 ka (Gillam, 1998; Carroll and others, 1999). Thickness 1–20 m

## UNDIFFERENTIATED DEPOSITS

Terrace and bog deposits (upper Holocene)—See descriptions for terrace (t) and bog deposits (b)

Contact—Dashed lines are contacts between geomorphic features in a map unit